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Science Response 2018/030

Maritimes Region

STOCK STATUS UPDATE OF AMERICAN LOBSTER (HOMARUS AMERICANUS) IN LOBSTER FISHING AREAS (LFAs) 27-33

Context

The scientific basis for assessing American Lobster (*Homarus americanus*) in Lobster Fishing Areas (LFAs) 27-33 was examined at a framework meeting in February 2011, followed by an assessment in July 2011 (DFO 2011, Tremblay et al. 2011, Tremblay et al. 2012a). These processes identified three stock units: LFA 27, LFAs 28-32, and LFA 33 and tabled key indicators. Upper Stock Reference (USR) and Lower Reference Points (LRP) based on landings are provided in the Integrated Fishery Management Plan (IFMP) for LFAs 27-33. These were modified in 2012 (DFO 2012, Tremblay et al. 2012b). New reference points were accepted for additional indicators at a recent framework meeting for LFAs 27-33 in January 2018. These indicators and reference points will be used to assess the stock in future stock assessments and interim stock status updates. This Science Response updates key biomass and abundance indicators: landings, commercial catch rates and catch rates of sublegal sizes from Fishermen Scientists Research Society (FSRS) recruitment traps to the end of the 2017 fishing season (2016-17 for LFA 33).

This Science Response Report results from the Science Response Process of February 14, 2018, on the Stock Status Update of American Lobster in Lobster Fishing Areas (LFAs) 27-33.

Background

Description of the Fishery

Lobster Fishing Areas 27-33 are on the Atlantic coast of Nova Scotia from northern Cape Breton to Shelburne County on the south shore (Figure 1). Recent commercial landings for stock assessment units 27, 28-32, and 33, were all high relative to the long-term means (Figure 2). For LFA 33, in particular, recent landings are among the highest on record, with increases from 7,069 metric tons (t) in 2015 to 10,049 t in 2016 and a moderate decrease to 8,017 t in 2017.

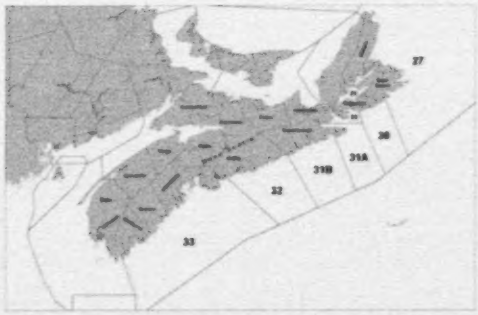

Figure 1. Map of the Lobster Fishing Areas (LFAs) 27-33.

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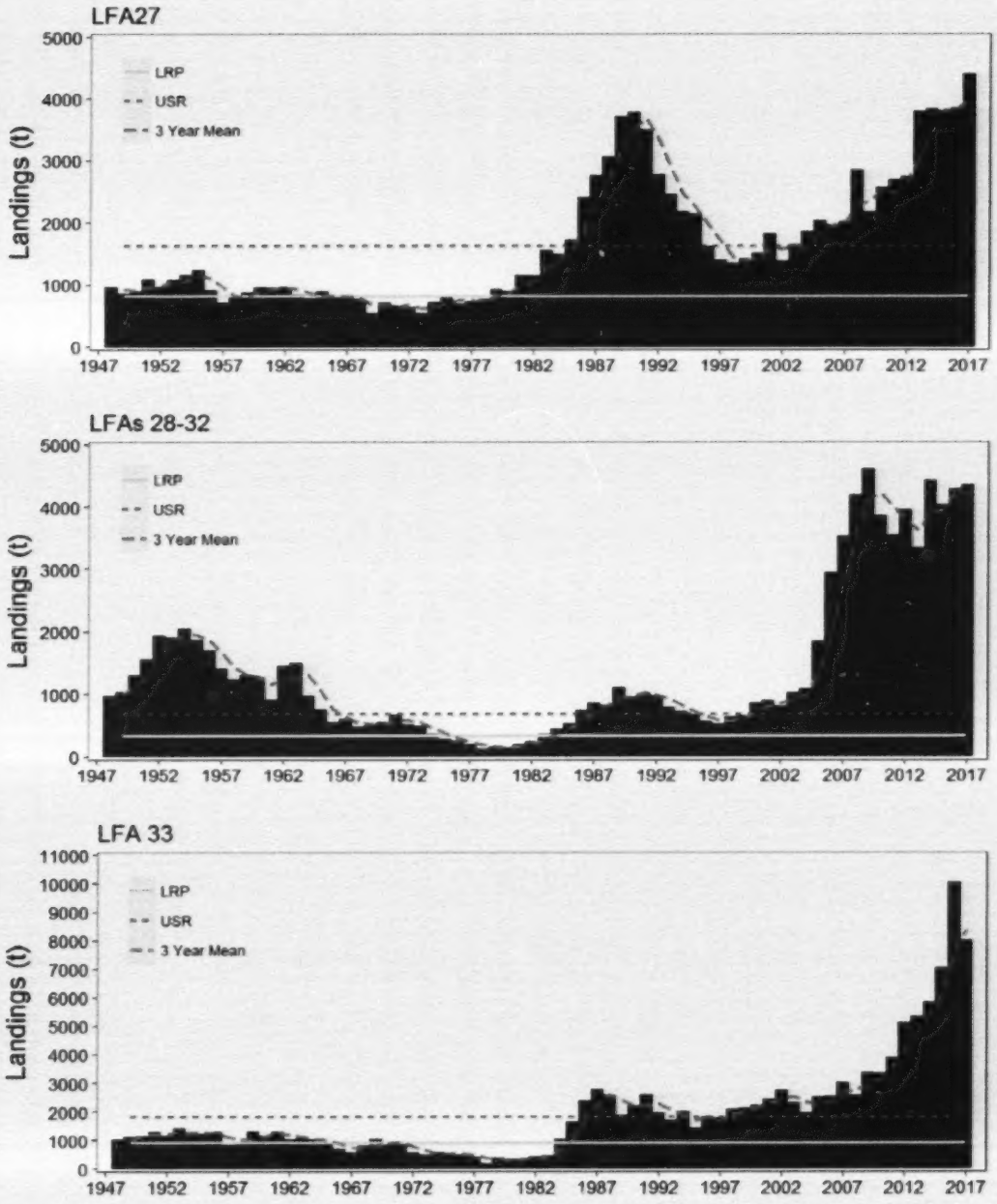

Figure 2. Annual Lobster landings (metric tons) by the commercial fishery in LFA 27, LFAs 28-32 combined, and LFA 33 from 1947 to 2017. The Gulf component LFA 27 landings are incorporated for 1947 to 2016. In LFA 33, landings are based on annual values from 1947-1975, and seasonal values from 1976-2017. Reference points representing the Upper Stock Reference (USR) and Limit Reference Points (LRP) are shown as blue dotted and green solid lines, respectively. The 3-year running mean is represented by a dashed red line.

Management measures across all LFAs include closed seasons, limits on the number of licenses, trap limits, minimum legal sizes (MLS), and protection of females with eggs (ovigerous or "berried"; Table 1). Additional LFA specific conservation efforts are outlined in Table 1.

Table 1. Numbers (No.) of licenses and management measures in LFAs 27-33 as of December 31, 2017. (N/A = not applicable).

LFA	Season	Total No. of licenses	Trap Limit[1]	MLS (mm)	Other Measures
27	May 15th - July 15th	519[2]	275	82.5	N/A
28	April 30th - June 30th [3]	14	250	84.0	Max. hoop size–153 mm
29	April 30th - June 30th [3]	63	250	84.0	Max. hoop size – 153 mm
30	May 19th - July 20th	20	250	82.5	Max. carapace length -135 mm for females
31A	April 29th - June 30th	72	250	82.5	Closed window,114-124 mm
31B	April 19th - June 20th	71	250	82.5	V-notching and release of 110 lb of mature females/ licence
32	April 19th - June 20th	157	250	82.5	V-notching, and release of 110 lb of mature females/ licence
33	Last Monday of Nov – May 31th	695	250	82.5	N/A

[1] Trap limit is for category "A" licence holder. Part-time or category "B" licences are allowed 30% and Partnerships 150% the limit of a single full-time licence.
[2] 481 within Maritimes Region (38 licenses in the Gulf Region).
[3] Regularly varied from the dates in regulations.

Analysis and Response

Landings-based reference points are included in the IFMP for LFAs 27-38. These were modified using an alternative reference time period (1985-2009 instead of 1985-2004) at a Maritimes Region Science Advisory Meeting in 2012 (DFO 2012). It was recognized that using landings as the sole indicator of biomass for lobster stocks has risks. At the framework and assessment for LFAs 27-33 in 2011, the following additional biomass and abundance indicators were identified - commercial catch rate and catch rate of sublegal sized lobsters in standardized traps. New reference points were accepted for additional indicators at a framework meeting for LFAs 27-33 in January 2018. These indicators and reference points will be used to assess the stock in future stock assessments and interim stock status updates.

Indicators of the Stock Status

Landings

The USR for the biomass of legal lobsters based on landings (Table 2) is defined as 80% of the median for the period 1985-2009. The metric for assessing where the stock is relative to the USR is the 3-year running mean of landings. For the season ending in 2017, this metric is above the USRs for all LFAs (LFAs 28-32).

Table 2. Lobster landings (metric tons) from 1998-2017, 3-year mean (2014-2016), and the Upper Stock Reference (USR) based on the 1985-2009 period as proposed in Tremblay et al. 2012 for LFAs 27-33. Lobster Fishing Area 27G represent the Gulf Landings proportion of LFA 27 and are included in the LFA 27 total. Landing values are as of January 29, 2018. (Dash (--) equals

Year	LFA 27	LFA 27G	LFA 28	LFA 29	LFA 30	LFA 31A	LFA 31B	LFA 32	LFA 28-32	Season	LFA 33
1998	1,347	88	12	52	70	72	128	309	643	97-98	2,103
1999	1,425	93	5	50	70	78	139	316	658	98-99	2,129
2000	1,505	106	5	54	54	87	212	448	860	99-00	2,243
2001	1,820	105	5	66	98	100	204	433	906	00-01	2,460
2002	1,395	102	8	57	79	103	210	358	815	01-02	2,764
2003	1,659	119	13	125	73	152	279	389	1,031	02-03	2,320
2004	1,850	115	8	190	84	213	305	289	1,089	03-04	1,955
2005	2,036	117	9	402	112	426	498	403	1,850	04-05	2,519
2006	1,966	118	11	658	187	672	825	602	2,955	05-06	2,556
2007	2,024	110	9	792	216	827	1,061	632	3,537	06-07	3,033
2008	2,849	138	13	1,076	413	962	1,031	704	4,199	07-08	2,599
2009	2,176	104	14	1,088	452	956	1,270	829	4,609	08-09	3,402
2010	2,570	146	12	914	371	911	1,001	657	3,866	09-10	3,377
2011	2,691	149	7	727	383	757	925	758	3,557	10-11	3,905
2012	2,751	161	11	729	416	807	1,080	922	3,965	11-12	5,126
2013	3,800	209	12	607	461	671	740	862	3,353	12-13	5,345
2014	3,844	174	16	759	455	806	1,148	1,239	4,423	13-14	5,835
2015	3,807	158	16	722	424	754	1,036	1,087	4,039	14-15	7,069
2016[1]	3,861	158[1]	9	791	417	724	1,069	1,289	4,299	15-16	10,050
2017[1]	4,404	--	8	725	515	821	1,187	1,096	4,352	16-17	8,017
Mean 2014-2016	**3,837**	**--**	**14**	**757**	**432**	**761**	**1,084**	**1,205**	**4,254**	**--**	**7,651**
USR	**1,629**	**--**	**120**		**79**	**250**		**242**	**688**	**--**	**1,838**

[1] Preliminary landings values.

Commercial Catch Rate

The Catch-Per-Unit-Effort (CPUE) of commercial sizes (CPUE, in kg•trap haul^{-1}) for 2004-2017 from mandatory logs and voluntary logs are shown in Figure 3 as black dotted and solid red lines, respectively. In each of the past four years, CPUE in LFA 27 north and south, were higher than those recorded for 2008-2012 and also the higher than those from the voluntary logs. In LFA 27 north and south, catch rates were declining or stable over the previous three years but have increased for 2017. For LFAs 28-32, CPUEs in 2017 were higher than 2016; all are at or above the mean of the full time series. The CPUE in LFA 33 continues to be higher in the west than in the east, and both areas increased between 2008 and 2016 but decreased in 2017.

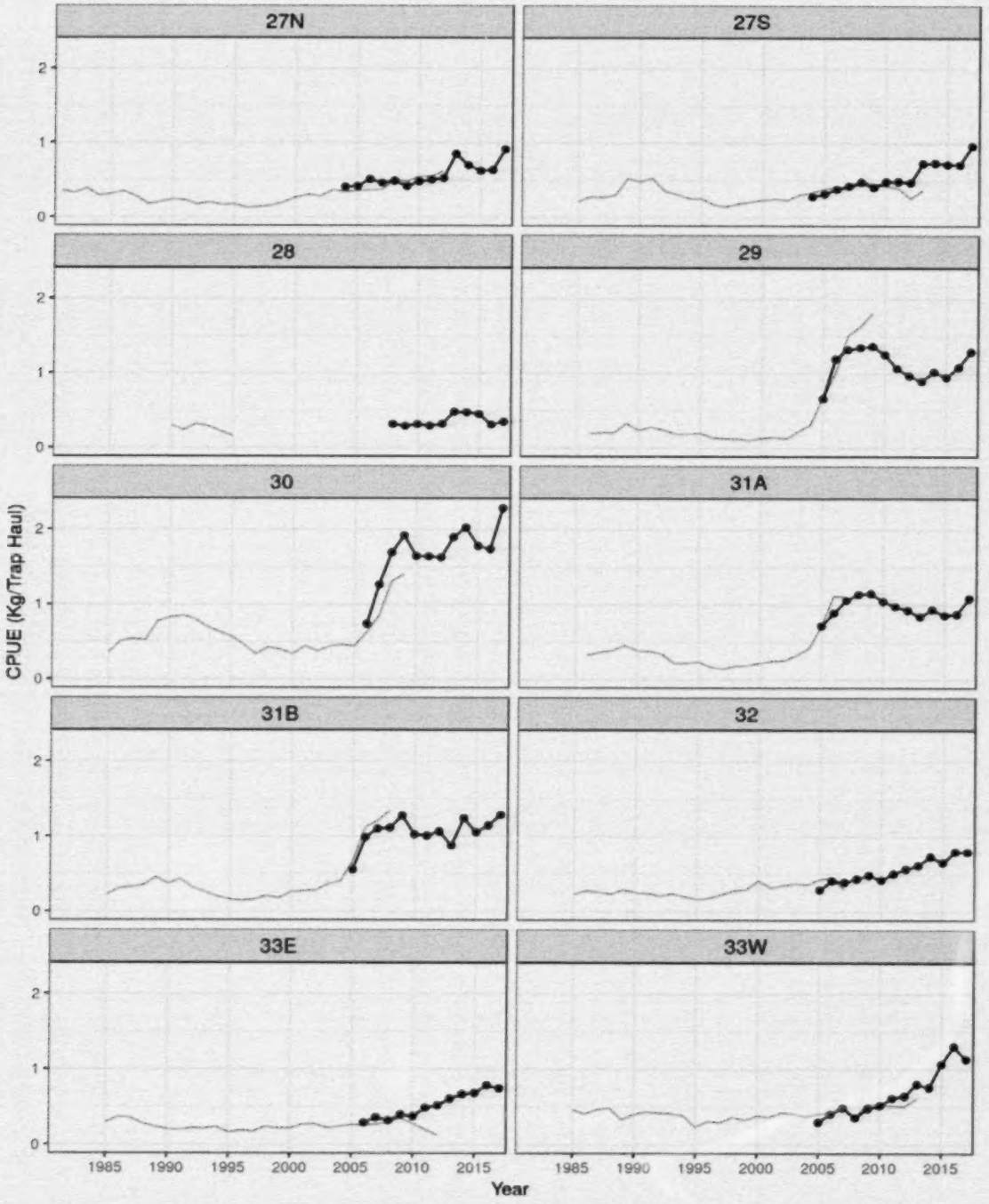

Figure 3. Trend in commercial Catch-Per-Unit-Effort (CPUE; kg•trap haul^{-1}) for LFAs 27-33 using mandatory log book data (black lines with points), voluntary logs (red lines). The CPUE is calculated as total weight landed/total trap hauls.

Catch Rate of Sublegals in Standardized Traps

The CPUE for sublegal sized lobster (number•trap haul^{-1}) for 1999-2017 from FSRS standardized traps are shown in Figure 4. For LFA 27 north and south, there has been an increase in the CPUE of sublegals since 2013 when compared to the 1999-2012 period. The increase over the last several years in LFA 27 was related to increases in MLS, as size classes of lobsters that were previously classified as legal are now deemed sublegal but are still retained by FSRS traps.

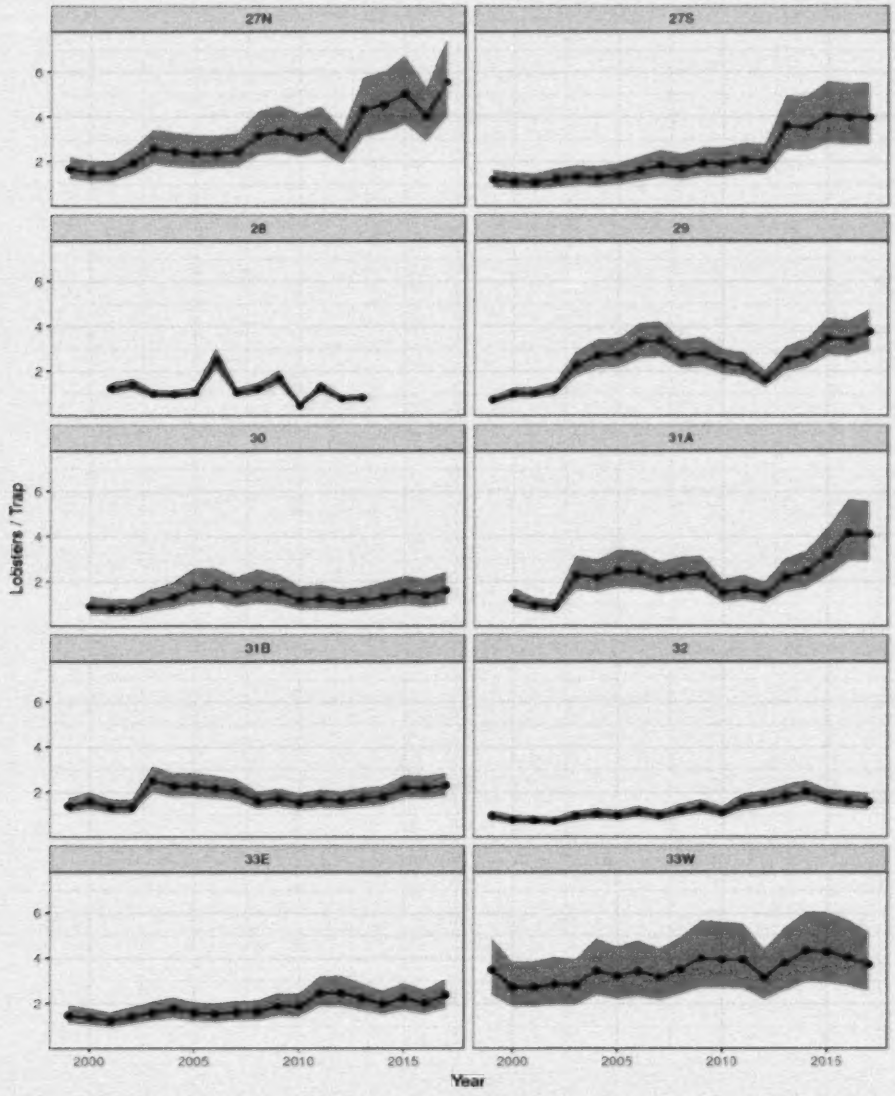

Figure 4. Trend in the catch rate of sublegal lobsters from recruitment traps (total number•total trap haul^{-1}) for LFAs 27-33. Trends are from area specific generalized linear mixed models of catch-per-unit-effort incorporating year, temperature, and abundance of legal sized lobsters as fixed effects and vessel as a random effect. 95% credible intervals are shown as shaded polygons.

For LFAs 29 and 31A, sublegal catch rates were increasing over the last several years, but have subsequently stabilized or decreased for 2017. Catch rates in LFA 30, 31B, 32, and 33E have been fairly stable over the past several years at levels above those recorded between 1999 and 2004. In LFA 33W, sublegal CPUE gradually increased between the early 2000s and 2015 but has been slowly declining in the past two years.

Conclusions

The Lobster stocks in LFAs 27, 28-32, and 33 at the end of the 2017 fishing season were considered to be within the Healthy Zone. The 3-year running means of landings for all individual LFAs were above the proposed USRs. Catch rates of legal and sublegal lobsters remain high relative to historic levels, providing support to the assertion that these stocks are in the Healthy Zone.

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Sources of Information

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